

EDITORIAL COMMENT

Aortic Stenosis: A Fatal Disease With But a Single Cure*

Blase A. Carabello, MD, FACC

Houston, Texas

Aortic stenosis (AS) is narrowing of the aortic valve creating an obstruction to outflow of blood into the systemic circulation. As AS worsens, the force the left ventricle must generate to overcome the obstruction increases progressively. Although inotropic reserve and the development of left ventricular hypertrophy serve initially to compensate for this increase in demand, these double-edged swords lead also to pathologic consequences, the onset of symptoms, morbidity, and mortality. Indeed there are few diseases in cardiology more lethal than severe symptomatic AS. Within 3 years of the onset of angina, syncope, or the symptoms of heart failure, 75% of symptomatic patients are dead unless the outflow obstruction is relieved by aortic valve replacement (AVR) (1). Thus before AVR there is a striking mortality risk of 2% a month. Almost all medical decisions

See page 122

regarding therapy are driven by weighing risks versus benefits of that therapy. Accordingly, there are few more striking contrasts in cardiology than between this huge risk of dying for the symptomatic AS patient versus the benefits of AVR (Fig. 1) (2). Still many patients with severe AS do not undergo AVR. Although advanced age by itself should never be considered a contraindication to AVR, risk of AVR is increased in older patients especially when comorbidities are present (3–5). Thus there are many patients whose physicians are reluctant to recommend AVR or who are reluctant to undergo AVR despite the recommendation to do so.

Enter again the risk-benefit ratio. Standard AVR is performed during general anesthesia with the aid of cardiopulmonary bypass. Although risk might be as low as 1% in compensated patients operated at high-volume centers (6),

usual risk is approximately 4%, growing to 10% to 30% in compromised patients (7). Risk is increased by the co-presence of coronary artery disease, severe myocardial dysfunction, far-advanced age, and the presence of other systemic illnesses. But if the risk of AVR could be reduced further, AVR would become progressively more palatable.

Obviously the prospect of AVR done transapically or percutaneously as presented by Webb (8) in this issue of the *JACC: Cardiovascular Interventions* opens new doors to AVR not conceived of by most of us just 5 years ago. With the transapical approach, a stented valve is inserted through a small thoracotomy into the apex of a beating left ventricle under anesthesia but without extracorporeal circulation. This approach avoids percutaneous access problems present in many older patients but obviously still requires surgery. In contrast, the percutaneous approach can be performed in awake patients without surgery. Both methods have steep learning curves, and both methods are still experimental in the U.S. Complications of the percutaneous approach are primarily related to the difficulties at the point of vascular access and of maneuvering the large bore delivery system around tortuous atherosclerotic vessels. These include vessel laceration and dislodgement of atherosclerotic debris and subsequent embolization. Both methods often result in mild paravalvular leaks that are usually hemodynamically insignificant. To the investigators' credit, all ethical issues have been avoided by proceeding only in very ill patients who were considered inoperable from standard approaches. In view of these substantial hurdles, the initial success reported on both sides of the Atlantic, with 2 different valve designs is striking and very encouraging (9,10).

Certainly we were here once before in the mid-1980s. Then, balloon valvotomy initially was greeted with much enthusiasm as a percutaneous solution to AS, only to rapidly fall out of favor when results only modestly reduced outflow obstruction and then usually only for a short period of time, eventually having little impact on the extreme mortality rate of untreated severe symptomatic AS (11).

But this is different. Now the aortic valve is being replaced, and if all else is equal, a replacement is a replacement. A percutaneous or transapically performed AVR will have at least some the benefits and risks of surgically implanted valves. The benefit of relief of outflow obstruction seems very similar to many currently available surgically placed valves. The major complication of such valves, structural deterioration, is obviously unknown for percutaneously implanted valves, and only the passage of time will address that issue. Although one might predict that because the materials used are similar to those of other biologic valves, they might last as long. However, predications of valve durability have been notoriously flawed in the past. It is fairly predictable that access-related problems will be reduced by engineering technology that has a way of miniaturizing things and overcoming existing hurdles and

*Editorials published in the *JACC: Cardiovascular Interventions* reflect the views of the authors and do not necessarily represent the views of *JACC: Cardiovascular Interventions* or the American College of Cardiology.

From the Department of Medicine, Baylor College of Medicine, and Veterans Affairs Medical Center, Houston, Texas.

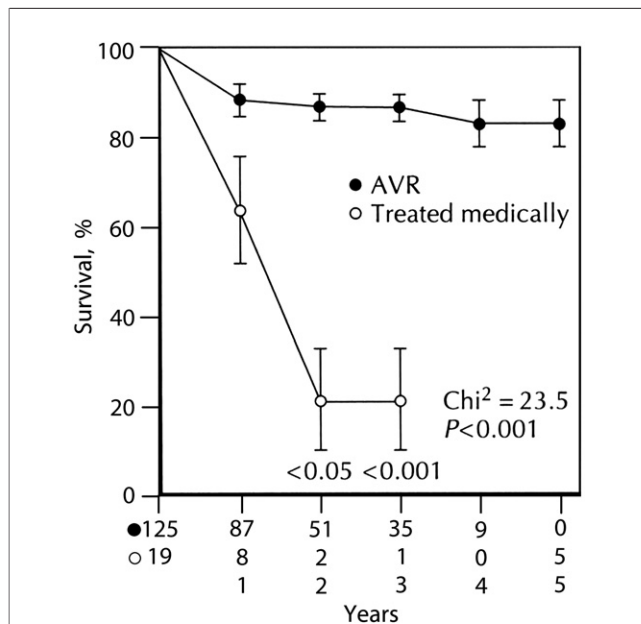


Figure 1. Survival in Aortic Stenosis

Demonstrates the stark difference in survival of patients with symptomatic aortic stenosis between those who were and those who were not treated with aortic valve replacement (AVR). Reprinted, with permission, from Schwarz et al. (2).

that durability (if it turned out to be a problem) will improve with subsequent valve generations.

So, what would we do if we had a percutaneously installed AVR that was durable and could be placed safely? Wouldn't it revolutionize the therapy for AS? First, let us admit that this is not a certainty. In the extensive data available for percutaneous coronary interventions, there is little proof that outcome, at least with respect to overall mortality, is any less than with bypass surgery (12). To be sure, percutaneous approaches are less painful and result in shorter hospital stays, but overall the results of the 2 methods are largely similar. In coronary revascularization, however, the comparison is between 2 entirely different techniques that provide improved myocardial perfusion. In the case of AVR, whether placed transaortically, apically, or percutaneously, the end product is still an AVR. And it already seems that the technique has opened new doors. Unlike the early uses of percutaneous coronary revascularization where virtually all the patients were surgical candidates and could be operated if the procedure ran amiss, the patients treated with percutaneous and apical AVR presumably would have been otherwise left to the dire fate of unoperated patients with AS.

Who will install these valves, and where? There is clearly angst among heart surgeons that AVR, once entirely in their domain, will become the bailiwick of the interventional cardiologist in the same way that coronary revascularization

has. I, for one, hope not. Each discipline, cardiology and cardiac surgery, possesses special knowledge and skills not held by the other. It is likely that the best outcomes for this new procedure will occur when both disciplines bring their skill sets to bear on the same patient in a hybrid operating room or catheterization laboratory. There, surgeons will bring forth their knowledge of prosthetic valves and anatomy, with the cardiologist providing unique catheter skills to the mix. Vascular surgeons, anesthesiologists, and imaging specialists can add further skills, enhancing outcome.

Severe symptomatic AS is a universally fatal disease that imparts misery by way of angina syncope and heart failure before death. Despite dramatic improvements in surgery, many patients are not availed of it for one reason or another. Hopefully transapical and percutaneous approaches added to traditional surgery will make life-saving AVR available to nearly anyone who needs it. Given the relative safety of these devices in the very ill patients treated thus far, I hope the devices and their successors will become widely available in the very near future.

Reprint requests and correspondence: Dr. Blase A. Carabello, Veterans Affairs Medical Center, Medical Service (111), 2002 Holcombe Boulevard, Houston, Texas 77030. E-mail: blaseanthony.carabello@med.va.gov.

REFERENCES

- Ross J Jr., Braunwald E. Aortic stenosis. *Circulation* 1968;38:61-7.
- Schwarz F, Banmann P, Manthey J, et al. The effect of aortic valve replacement on survival. *Circulation* 1982;66:1105-10.
- Melby SJ, Zierer A, Kaiser SP, et al. Aortic valve replacement in octogenarians: risk factors for early and late mortality. *Ann Thorac Surg* 2007;83:1651-6.
- Kohl P, Kerzmann A, Honore C, Comte L, Limet R. Aortic valve surgery in octogenarians: predictive factors for operative and long-term results. *Eur J Cardiothorac Surg* 2007;31:600-6.
- Salazar E, Torres J, Barragan R, Lopez M, Lasses LA. Aortic valve replacement in patients 70 years and older. *Clin Cardiol* 2004;27:565-70.
- Sievers HH, Thorsten H, Stierle U, et al. A critical reappraisal of the Ross operation: renaissance of the subcoronary implantation technique? *Circulation* 2006;114 Suppl:I504-11.
- Connolly HM, Oh JK, Schaff HV, et al. Severe aortic stenosis with low transvalvular gradient and severe left ventricular dysfunction: result of aortic valve replacement in 52 patients. *Circulation* 2000;101:1940-6.
- Webb JG. Percutaneous aortic valve replacement will become a common treatment for aortic valve disease. *J Am Coll Cardiol Interv* 2008;1:122-6.
- Cribier A, Eltchaninoff H, Tron C, Bauer F, Gerber L. Percutaneous implantation of aortic valve prosthesis in patients with calcific aortic stenosis: technical advances, clinical results and future strategies. *J Invasive Cardiol* 2006;19:S88-96.
- Webb JG, Pasupati SJ, Humphries K, et al. Percutaneous transarterial aortic valve replacement in selected high risk patients with aortic stenosis. *Circulation* 2007;116:755-63.
- Otto CM, Mickel MC, Kennedy JW, et al. Three-year outcome after balloon aortic valvuloplasty: insights into prognosis of valvular aortic stenosis. *Circulation* 1994;89:642-50.
- Serruys PW, Unger F, Sousa JE, et al. Comparison of coronary-artery bypass surgery and stenting for the treatment of multivessel disease. *N Engl J Med* 2001;344:1117-24.